CLOSE-RANGE PHOTOGRAMMETRY TECHNIQUES FOR BUILDING INVENTORY IN URBAN RESIDENTIAL AREAS

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The Technical Assistance Organization (TAO) Pilipinas, Inc. – a women-led, non-stock, non-profit, non-government organization in the Philippines that aids in the physical planning, development, and management of urban and rural poor communities – has been collecting building inventory data using traditional methods to assist their partner community in their decade-long fight for their claim to the land. This study presents a modern approach to assist the organization in providing technical assistance to the residents of Lupang Arenda, a 80-hectare land located in a highly urbanized area in Taytay, Rizal wherein informal settlers have lived for generations. Although not as popular as the traditional methods, photogrammetry has been gaining traction in the field of surveying in the Philippines. As consumer-grade imaging devices become cheaper and more powerful, close-range photogrammetry (CRP) is seen as a good alternative given the manpower, budget constraints, and scale of the project handled by the organization. In this study, CRP workflows were implemented to measure dimensions of residential buildings, specifically frontage and height, for building inventory using a smartphone camera and a Digital Single-Lens Reflex (DSLR) camera. Artificial markers with a size of 1x1 cm, which served as reference points, were placed at 0.5 meter-spacing on different portions of a house such as window corners, roof corners and doors. Relative positions of natural markers and the artificial markers were measured using steel tape and total station due to lack of established survey control monuments in the area. The image acquisition process was carried out by calculating first the distance between the camera stations to achieve a 70% side overlap and 80% forward overlap considering the size of the row houses and road width, and then marking the ground using steel tape to set the calculated distance between each camera station. Initial processing of the acquired datasets include filtering the images that were out of focus, heavily tilted and with relatively high amount of exposure and plotting of coordinate points in AutoCAD for spatial reference. The processing of images using Agisoft Metashape involve these steps: (1) Image quality checking and removal of image quality < 0.5, (2) Alignment of photos, (3) Removal of unnecessary and erroneous points, (4) Photo alignment optimization, (5) Creation of markers and control scale bars and (6) Building dense cloud. Comparing the measurements from the dense cloud with the measurements on-site using steel tape and total station results to Root Mean Square Errors (RMSE) ranging from 2.5 millimeters to 6.4 centimeters — which are within the centimeter accuracy standard set by TAO-Pilipinas. With these findings, the CRP workflows using low-cost cameras employed in the study can support the activities of the organization with the use of cheaper resources in doing their field measurements in a shorter period of time. Since the organization will be taking measurements of thousands of houses, employing CRP techniques is far more advantageous than the traditional methods.

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